gelatine which have an active swarming motion when placed in water, and which he calls spermatia; these he says will not germinate, but I advise you to try for yourself. These bodies are usually referred to the genus Cytispora or Næmaspora, belonging to a totally different order of Fungi, the Sphæronemei of the Coniomycetes. You will probably also find various moulds appearing on the sticks, some of which are very curious, and have received very long and hard names, and your experience will differ from mine if you do not find a number of forms which you will not expect and which will puzzle you very much. Note and draw them all, and combine your results in a paper for the NATURALIST, which shall give the life history of the particular Hypoxylon, Diatrype, Valsa or Sphæria, with which you have experimented.

The field is very wide, and the experiments of one man must be checked by those of another to get our knowledge of the subject established upon a satisfactory basis.

I feel sure that any one who gets fairly started in this field of investigation will find it infinitely more amusing, interesting and satisfactory than looking at specimens purchased ready mounted and labelled.

There is another, and the usual mode of studying this subject, namely, the collecting all the specimens you can get and having ascertained their specific names put them in an herbarium. This kind of work very few can have the necessary facilities for doing, for it is absolutely necessary to have access to authentic specimens and good libraries to obtain valuable and satisfactory results. It is work which must be done by somebody, but it involves a good deal of uninteresting labor, and is not at present so desirable as the mode of investigation which I have indicated.

THE TOAD AS AN ENTOMOLOGIST.

BY A. S. RITCHIE.

THE principal object of the following notes on the toad as a collector of beetles, is to show how useful some of the lower animals are to man in his search after knowledge. Before entering on the

subject, a few remarks on the habits of the toad may not be uninteresting.

From the earliest accounts relating to this creature it has always been looked upon by the people as ugly, hideous, and venomous, while even supernatural powers have been attributed to it. Thus an old author says: "If the toad burrowed near the root of a tree every one who ate a leaf of that tree would die, and if he only handled it, would be struck with sudden cramps." Some of the antidotes recommended for toad venom are the following: Black hellebore, powdered crabs, the blood of the sea-tortoise mixed with wine, the stalks of dogs' tongues, the powder of the right horn of a hart, cummin, the vermet of a hare, the quintessence of treacle and the oil of a scorpion, mixed and taken *ad libitum*.

Even in those days when these elaborate prescriptions were invented some good was acknowledged to exist in the toad. The "toad-stone" is alluded to by Shakespere in the passage:

> "Sweet are the uses of adversity,
> Which like a toad, ugly and venomous,
> Wears yet a precious jewel in its head."

During the middle ages the stone found in the head of this reptile was popularly believed to be possessed of the power of giving warning of the presence of poisons. Fenton, writing in the year 1569, says: "There is to be found in the heads of old and great toads a stone they call borax or stelon. This worn in a ring gives a forewarning against venom." Another recommendation the toad had in those days was "its power as a styptic." Supposing any one to fall down and knock his nose against a stone, he could instantly stop the bleeding if he only had in his pocket a toad that had been pierced through with a piece of wood and dried in the shade or smoke. All he had to do was to hold the dried toad in his hand and the bleeding would immediately cease. The reason for this effect is, "that horror and fear constrained the blood to run into its proper place, for fear of a beast so contrary to nature."

In our day, however, the properties of this animal are better understood, although to a great extent it is still held to be venomous by the people, and generally killed wherever it is found.

Recent investigations go to prove that an acrid secretion covers the body of the toad, which is the cause of sore mouths in dogs attacking it. One of the great uses of the toad is its propensity

for destroying insects injurious to vegetation. Our gardeners ought to introduce them into their gardens and cultivate the acquaintance of these creatures, their little trouble in so doing would be amply compensated.

The toad is of a retiring disposition, loving dark corners and shady places. It has a slow, jumping motion, and is of a very timid disposition. Numerous instances might be cited of pet toads, and of their becoming quite tame.

The toad differs in some respects from the nearly related frog. The structure of the mouth is, however, nearly the same; the tongue is attached by the root, as it were, to the base and front of the mouth, the tip being reversed and pointing down the throat when the animal is at rest.

The moment it sees an insect its eyes brighten and sparkle, the toes twitch and quicker than the eye can follow, the tongue is thrown out, the insect transfixed, and withdrawn into the mouth.

Unlike the frog, the toad does not spring after its prey, but remains seated. Having kept frogs in the aquarium, I have noticed that they will spring two or three times their own length from the moss to catch a fly on the glass, using their tongue, as it were, on the jump. They seldom miss their mark. As far as my experience goes, neither of these animals will eat anything without life or motion. I have, however, often deceived a frog by moving a dead fly in the sight of the creature, which it always took readily.

Many stories have been told of toads in rocks, and reasons have been given by authors as to the way in which they became so embedded. My subject has, however, nothing to do with these "old great toads," but to one of our own day and generation. After this digression, I shall now introduce my friend, the toad, in his capacity as a collector of beetles.

The true naturalist, in the pursuit of his study, is a very teachable individual; he never refuses assistance from any one, whatever his station in life is, or however meagre his knowledge of the science may be. The many ways he uses the animal creation to advance his knowledge in the particular branch of study, may be illustrated as follows: —

The conchologist wearies for the pleasant days of summer, to take a trip to the sea-side, with his dredges and lines, his bottles and store boxes, where he adds to his collection many interesting and perhaps new forms of molluscan life.

A trip to the sea-side is not always easily obtained; but the naturalist may be seen in the markets buying the several species of flat fish, such as flounders and other species which live and feed at the bottom of the sea. Knowing them to be good collectors, he takes advantage of this fact to procure many and sometimes rare species, and thus adds to his cabinet, without the trouble of dredging for them.

The entomologist, likewise, has recourse to different methods to obtain the objects of his interesting study. The following is one of many:

Starting at six o'clock one morning, in the summer of 1864, for a walk to our beautiful mountain to collect insects, provided with the requisite apparatus, a wide-mouthed bottle, with spirits, for beetles, and a small flat box, lined with cork, for butterflies, etc., my success was particularly good. The first captures were eleven specimens of carrion beetles, comprising three species, viz., *Silpha peltata*, *Silpha marginalis* and *Silpha inœqualis*. These were obtained from the body of a dead hawk-owl (*Surnia ulula*). Having secured them in the bottle, and while walking leisurely along, I noticed a toad (*Bufo Americanus*) sitting contentedly at the root of a basswood tree (*Tilia Americana*). Having never made use of my dingy friend as an insect collector, although aware of his propensity that way, my mind was made up to press him into the service—but how? He must be dead first. As he sat looking at me with his beautiful eyes (for although his appearance is not very prepossessing, still those beautiful, bright, yet languid eyes go a great way to improve his appearance), I had certain qualms of conscience about taking his life; still it was in the cause of entomology, and for the furtherance of science his life was sacrificed. Now he was dead; how was I to proceed? I had cut up and dissected many insects as well as birds; but to cut up a toad, and before breakfast—"there's the rub"—that grey, warty toad, no beautiful eyes now. One slash of the knife through the skin, another through the walls of the stomach, and the poor creature's breakfast was exposed.

I was a little disappointed at first, as one or two common forms of beetles presented themselves, that might have been obtained without sacrificing the poor animal; still, I reasoned as he had been up nearly, or perhaps all night, collecting, and I had not, he must have taken some species not in my collection. Having

scraped the contents of his stomach into my bottle of spirits, I started home, resolved to see what the insects were before breakfast.

I spread them out on a sheet of blotting-paper and counted them, the result being as follows, naming them for the benefit of my entomological friends, who have not made use of the toad as a collector of insects:—

There were thirteen perfect specimens, viz.,—

	No. of Specimens.
Cymindis pilosa, rare,	one.
Platynus cupripennis, common,	two.
Bembidium quadrimaculatum, uncommon,	one.
Cercoyn, undetermined,	three.
Tachyporus jocosus, common,	one.
Pæderus littorarius, rare,	one.
Ips faciatus, common,	three.
Ips sanguinolentus, common,	one.

Besides these, there was one elytron each of Hippodamia and of Brachycantha; also vestiges of legs and wings of other insects.

I have killed several toads since, with similar results; one, I may mention, had the stomach filled with a species of *Chrysomelidæ*, *Doryphora trimaculata*, amounting to eleven specimens. He had evidently come across a colony of that insect, and made a hearty breakfast. I may state that this insect was in great abundance, during 1864, on the Island of Montreal. The same may be said of last summer, 1868; taking them by the score on the Mountain, also along the river at Hochelaga.

The earlier you go out in the morning the better; before sunrise, if possible, ere the process of digestion has gone too far.

Birds are also very useful as collectors of insects, as may be seen by the following from one of the daily papers, being only one of many thousand examples:—

BIRDS THE FARMER'S FRIENDS. — An intelligent farmer boy in Illinois observed a small flock of quails, commencing at one side of a cornfield, taking about five rows regularly through the field, scratching and picking around every hill, then returning and taking another five rows, until thinking they were pulling up the corn, he shot one and then examined the field. On the ground they had been over, he found but one stalk of corn disturbed, but in the quail's crop he found one cut worm, twenty-one striped vine bugs, over a hundred chintz bugs that he could distinctly count, and a mass apparently consisting of hundreds of chintz bugs, but not one kernel of corn. During the past five years the quails in that vicinity have been decreasing, and the chintz bug increasing.

It will thus be seen, from what has been said regarding the habits of those humble animals, toads and birds, what great ser-

vices they render to man in the economy of nature, and will, it is hoped, tend to show that it is the duty of all, especially of agriculturists, to preserve such valuable animals.— *Canadian Naturalist and Geologist.*

FRESH WATER SKETCHES.*

BY PROFESSOR L. W. BAILEY.

It must not be inferred, from the title above given, that it is the purpose of the author, in the following "Sketches" to impose upon the readers of the NATURALIST, either a temperance tract, or a treatise on hydropathy, a fisher's manual, or even a guide to the lakes. The disciples of Isaac Walton will find that like Buller, I have tabooed the whole subject of angling, "and all its endless botheration about baskets and rods, and reels and tackle — salmon-trout, sea-trout, perch, pike, etc.," — nor must the tourist look here for descriptions of the picturesque, the beautiful, and the grand, as displayed in the scenery of our unrivalled rivers, lakes and cataracts. My object, on the contrary, is to allude but slightly, if at all, to the charms of our inland aquatic scenery, or even to such objects of natural history, as may meet the eye of every observer, but rather to present, in a familiar way, some account of the minute, but marvellous wonders, which may be found by the aid of the microscope in every pool, pond, lake or river in our country. As the sketches in question have not the formality of a scientific treatise, and are divested to a considerable degree of technical language, I hope they may find some readers among those who might be repelled by a more pretending title or a more ponderous theme. If they serve to recall to the accomplished microscopist, some of the pleasures which have often "lent a

*The idea of these sketches was first suggested by some manuscript notes, left among the papers of my father, the late Prof. J. W. Bailey, of West Point, and which had been written with a view to the preparation of a small volume, similar in its general character to "the Sea-side Book" of Harvey, but relating exclusively to the more minute and microscopic forms to be met with in ordinary fresh waters. A few pages only of this work having been completed, and the present writer not being in a position to carry out the intention originally entertained, he has, in the following pages, embodied a portion of the notes in question, in a modified form, with the results of such observations as he has himself been able to make upon the subjects alluded to.—L. W. B.